



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of: Mesing et al. :  
:  
Serial No. 09/613,162 : Group Art Unit: 1733  
:  
Filed: July 10, 2000 : Examiner: Musser, Barbara J.  
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For: POLYIMIDE RESIN AND CARBON FIBER MOLDED TUBE CLAMP

Mail Stop Appeal Brief – Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

**APPEAL BRIEF**

Please charge the Appeal Fee of \$330, and any other charges necessary for consideration of this appeal to McNees, Wallace & Nurick Deposit Account No. 50-1059. In accordance with 37 C.F.R. 1.192, this brief is being filed in triplicate.

This Appeal Brief is filed in response to the third rejection of the Examiner dated December 3, 2003, pursuant to 37 CFR §1.191.

Certificate of Mailing (37 CFR §1.8 (a))

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Name of Person Depositing Lindsay K. Vican

Signature of Person Depositing 

Date Signed March 26, 2004.

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**1. REAL PARTY OF INTEREST**

The real party of interest in this pending application is General Electric Company, Assignee of inventors' interest, which assignment has been duly recorded in the United States Patent and Trademark Office on July 10, 2000, at Reel/Frame No. 10931/0033.

**2. RELATED APPEALS OR INTERFERENCES**

There are no other appeals or interferences known to Appellants' legal representative or Assignee which will directly affect or be directly affected by or have a bearing on the Board's Decision in this pending appeal, nor are there any directly related co-pending applications known to Appellants' legal representative.

**3. STATUS OF CLAIMS**

Claims 1-35 are pending in the present application. Claims 13-30 are subject to a restriction requirement and have been canceled from consideration without prejudice. Claims 1-12 and 31-35 are pending in the application. Claims 1-12 and 31-35 have been rejected for a third time by the Examiner as a result of a new search undertaken by the Examiner after Appellants' response to the second Office Action and after an interview with the Examiner. Claims 1-12 and 31-35 are appealed.

**4. STATUS OF AMENDMENTS**

Appellants have submitted no response to the December 3, 2003, Office Action, rejecting claims 1-12 and 31-35 for a third time. Instead, Appellants have exercised their rights under 37 C.F.R. 1.191.

**5. SUMMARY OF INVENTION**

The present invention provides a process for manufacturing a polymer resin fiber composite tube clamp, which takes advantage of the weight savings of composites, and through use of a net molded fiber reinforcement, significantly increases the delamination/cracking resistance, and at the same time, does not expose abrasive fiber ends which could create wear on a tube contained within the clamp. The process of the present invention utilizes prepreg plies of polymer matrix composite material. Each ply is comprised of a fiber embedded in a thin layer of

curable material such as a polymer resin matrix. The fibers in a prepreg layer generally are unidirectionally oriented and lie in the plane of the sheet. Prepreg plies are known in the art.

The present invention utilizes the prepreg plies to form a tube clamp from the polymer matrix composite material. The tube clamps used to clamp tubes generally have an arc, being generally semi-cylindrical, to match the contour of the tubes that they clamp. The novelty of the present invention resides in the processing of the clamp material to form the clamp. The plies are laid up in such a manner as to produce a tube clamp comprised of plies in which the prepreg plies lie in the direction of the contour of the tube clamp, that is to say, the fibers in the plies lie parallel to the surface of the tube clamp. To obtain a surface in which the fibers lie parallel to the surface of a contoured tube clamp, such as is shown in Figures 2 and 3 of the present application, (copies of which are attached for convenience), special lay-up procedures and tooling are required. Special lay-up tooling is provided so that the plies can be laid up in a parallel arrangement while providing the desired contour. Because of the contour of the surface, as best shown in Figure 2, it is necessary to provide and arrange filler plies having a predetermined shape in predetermined regions that would otherwise form voids or be filled with a monolithic material such as a polymeric resin. Alternatively, these regions may be filled with resin impregnated with chopped fiber. This fiber-reinforced material solves the additional problem of weak monolithic regions, the fiber-reinforced material in these regions providing strength.

The present invention is different from prior art tube clamps made from composite materials. These clamps were made in the form of a pair of blocks and the contour was machined into the block. The machining exposed the fibers in the clamp to the surface of the tube resulting in the ends of the fiber abrading the tube. The present invention solves this problem, as tube clamps made in accordance with the present invention do not have exposed fiber ends, as the fibers immediately adjacent to the surface of the tube have lengths that are parallel to the surface of the tube.

**6. ISSUES**

- A. Whether Doyle, as used by the Examiner, teaches away from Wiley, and whether Doyle is properly combinable with Wiley to establish prima facie obviousness under 35 U.S.C. §103.
- B. Whether Wiley in View of Doyle, Livesay and admitted prior art, even if properly combinable, yield Appellants' claimed invention.
- C. Whether the claimed invention as a whole must be considered.
- D. Whether the combination of Wiley in view of Doyle, Livesay et al. and the admitted prior art is based on hindsight reasoning by the Examiner.

**7. GROUPING OF CLAIMS**

Claims 1-12 and 32-35 are rejected under 35 U.S.C. §103(a) as being unpatentable over Wiley in view of Doyle, Livesay et al. and the admitted prior art.

The claims do not stand or fall together. Claim 1 is an independent claim. Claims 1, 5, 9 and 10 stand and fall together. Claim 2 does not stand or fall with claim 1. Claim 2 adds further additional limitations regarding sheet fiber orientation (unidirectional) and the contour of fibers in the cured material after removal from the tooling and its patentability should be considered in light of these additional limitations. Claims 3 and 4 stand or fall together, but not together with claims 1 or 2. Claim 3 adds different limitations regarding sheet fiber orientation (bidirectional or woven) and the contour of fibers in the cured material after removal from the tooling. The patentability of claims 3 and should be considered in light of these different limitations. Claims 6- 8 and 31-35 stand or fall together, but not with the claim groupings of claims 1, 2, 3, 4, 5, 9 or 10; and their patentability should be considered in light of their additional limitations.

Claim 11 does not stand or fall with claims 1-10. Claim 11 is an independent claim and differs from claim 1 in that it requires injection molding a polymer into fiber bundle comprised of a plurality of sheets in which fibers are not exposed when the cured tube clamp is removed from the layup tooling. The patentability of claim 11 should be considered in light of its limitations.

Claim 12 does not stand or fall with the other claims. Claim 12 incorporates additional limitations and its patentability should be considered in light of these additional limitations.

Claim 31 is rejected under 35 U.S.C. §103(a) as being unpatentable over Wiley in view of Doyle, Livesay et al, and the admitted prior art as applied to claim 2 and further in view of Yamamoto et al. Although an additional reference is cited against this claim, it stands or falls with claims 6-8 and 32-35 as noted above.

## **8. ARGUMENTS**

### **A. Re Doyle, As Used by the Examiner, Teaches Away From Wiley, And Is Not Properly Combinable with Wiley to Establish Prima Facie Obviousness Under 35 U.S.C. §103.**

Wiley, U.S. Patent No. 5,435,506, as understood, discloses a tube clamp for use with gas turbine engines. Wiley does not teach the use of unidirectional pre-preg sheets or plies. Wiley at column 3, lines 44-50 clearly teaches away from sheets plies. Wiley specifically teaches the use of PMR-15 with randomly oriented graphite material that is continuously molded by compression molding into the configuration needed. The continuous molding using compression molding disclosed by Wiley teaches away from the use of layers, as taught by Appellants. Appellants refer to ASM Handbook Volume 21, COMPOSITES p. 516 for a complete discussion of compression molding, which has been provided to the Examiner in this application. Wiley teaches or suggests no other method. That Wiley does not recognize the problem solved by the present invention is evidenced by reference to Wiley at column 3, lines 52-55 which discusses slicing molded material into individual clamp shells. The process of slicing as disclosed in Wiley does not contemplate the fibers that inevitably will be exposed by cutting a reinforced material comprising randomly oriented fiber in a resin matrix. These exposed fibers are the source of the problem the present invention solves. Wiley, at Fig. 1 requires the use of a grommet 12, which will be interposed between the clamp and the tube. The grommets are unexplained by Wiley, but suggests the need to isolate the tube from the clamp to act as a wear sleeve and prevent wear from exposed fibers. These disclosures in Wiley specifically do not recognize the problems associated with exposed fibers, which problem

is solved by Appellants, and further teaches away from Appellants' invention, which avoids exposing fibers. This problem was recognized by the Appellants at page 2 and 4 of his specification and is solved by the present invention.

Doyle, U.S. Patent No. 5,271,588, is directed to a tube clamp for a gas turbine engine. Doyle was first introduced into the prosecution history in Paper No. 13, which represents the third rejection. As currently understood, Doyle discloses the manufacture of a tube clamp made from a composite material, which is described in Doyle at column 6, lines 60. These composite materials are formed from resins such as PMR-15 and fibers. "The fibers may be oriented at random or may be aligned as required for obtaining suitable strength of the base and capture plates 20, 30." Doyle recognizes that fibers or resin can abrade during operation. Doyle includes a capture plate 30 and a base plate 20. While the random fibers can clearly be oriented in any direction, Doyle provides no teaching as to the direction of orientation of the aligned fiber. The fiber can be oriented perpendicular to the axis of the aperture, parallel to the axis of the aperture or at some intermediate angle. If oriented at any angle other than parallel to the axis of the aperture, the ends of some of the aligned fiber will be exposed. Although the base plate has a contour, there is no teaching or suggestion that fibers are aligned parallel to the surface of the contour. To the contrary, Doyle suggests, indeed recognizes, that fibers are exposed to the tube. However, Doyle unlike the present invention does not recognize that the exposed fibers of the tube clamp will contribute to the wear of the tube by abrasion. Unlike Appellants' invention, which teaches such wear, Doyle teaches that the fibers (or resin) will abrade, but this fiber abrasion is beneficial, resulting in releasing of a dust or powder which will act as a dry lubricant between the tubes and tube clamp. See Doyle at column 6, lines 55-58. To the extent that Doyle does recognize the problem of tube wear, without recognizing specifically the source, Doyle's solution, set forth at column 6, lines 58-63, is to apply a conventional wear coating to the interface between the tube and tube clamp, recess 26, or to utilize conventional wear sleeves. These solutions to the problem of wear do not teach or suggest the methods used by the Appellants of the present invention to solve the problem of wear at this interface.

Livesay et al., U.S. Patent No. 5,837,185, as understood, teaches a process for the preparation of reinforced composite structures comprising one or more layers of material by resin transfer molding utilizing vacuum directed fabrication and utilizing a photocurable or peroxide curable matrix. Livesay et al. discloses a process for preparing one or more plies of

resin-impregnated material comprising a fiber mat or fabric matrix and a resin composition utilizing vacuum bag molding techniques. One or more fiber mats or fabrics are enclosed within a textured vacuum envelope having a resin supply source and at least one vacuum port. The invention also provides a process for increasing the thickness of a composite structure without the formation of bond lines.

In Paper No. 13, the Examiner rejects claims 1-12 and 32-35 under 35 U.S.C. §103(a) as being unpatentable over the combination of Wiley in view of Doyle, Livesay et al., and the admitted prior art. The Examiner specifically states:

Wiley discloses forming tube clamps by compression molding fiber-reinforced polymer in the shape of a tube clamp and then removing the shaped material from the mold (Col. 3, ll. 44-57). While the reference discloses polyamide, a thermoplastic, the material listed, PMR-15, is a mixture of polyimide and carbon fibers as shown by Doyle (Col. 6, ll. 40-41). Clearly, the use of polyamide rather than polyimide is a spelling mistake in Wiley. Thus, the material used, PMR-15, is a thermosetting material, i.e. is capable of curing. One in the art would understand that the material was cured, as that is how thermosetting materials are intended to be used.

The Examiner further notes:

The reference does not disclose unidirectional pre-pregs. Doyle discloses a composite tube clamp made from random or aligned, i.e. oriented, fibers impregnated in a thermosetting resin (Col. 6, ll. 35-50). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use unidirectional fibers in the tube clamp of Wiley since Doyle discloses random and aligned fibers are well-known alternatives when forming a tube clamp and that aligned fibers can be chosen to provide suitable strength of the clamp. (Col. 6, ll. 47-50).

Wiley is silent as to whether one or more layers of material are used to form the tube clamp. However, using one or more sheets of fibers to form a composite is well-known per se in the composite molding arts as shown for example by Livesay et al. which discloses one or more fiber sheets can be laid-up in a mold to form a structure (Col. 4, ll. 12-17) and by the admitted prior art which discloses forming a tube clamp from multiple layers of material (Pg. 2-3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use multiple fiber layers as it is known in general in the molding arts to use one or more layers of fibers to form a product as shown for example by Livesay (Col. 4, ll. 12-17) particularly in view of the admitted prior art which discloses it is known to make tube clamps from multiple layers of material. (Pg. 2-3). Since aligned fiber layers do not have fibers running perpendicular to the plane of the

layer, there would be no exposed fibers when the material was removed from the mold.

Here, the Examiner's apparent motivation for establishing the prima facie case of obviousness is based on the fact that Wiley discloses compression molding a tube clamp using PMR-15 and fibers, while Doyle discloses a composite tube clamp made from random or aligned fibers in a thermosetting resin, and therefore the combination of Wiley and Doyle would have been obvious to provide unidirectional fibers in a tube clamp. Since Wiley is silent as to the use of one or more layers, the Examiner relies on the teachings of Livesay et al. to provide a plurality of layers. The Examiner further notes that the admitted prior art discloses it is known to make tube clamps from multiple layers of material.

The Examiner misses the point of the invention. Clearly, the Appellants disclose as prior art the manufacture of tube clamps using sheets or plies of prepreg material including PMR-15. This prepreg is laid up into large flat plates and cured. Clamps are then machined from the plates, the machining exposing the fiber. The Appellants also specifically disclose the use of PMR-15 for high temperature applications, which is a polyimide matrix known for its high temperature capabilities.

Wiley discloses a tube clamp made from fiber-reinforced polymer. Wiley does not teach the use of unidirectional plies, and, in fact, teaches away from the use of sheet plies, teaching instead the use of randomly oriented graphite fiber continuously molded by compression molding. The Doyle reference, relied on by the Examiner, discloses what the Appellants have disclosed in their specification. Referring to Figure 1 of Doyle, capture plate 30 is essentially the flat plate discussed by Appellants. Base plate 20 is a contoured plate. There is no specific teaching in Doyle that the plies of Doyle are layered along a contour of layup tooling, cured and removed from the layup tooling while retaining the shape of the layup tooling without exposing the fibers. Appellants submit that Doyle is manufactured as set forth in Appellants specification, that is, the base plate 20 is machined from a cured, flat plate. Although the capture plate is essentially a flat plate, to the extent that it has a contour, as evidenced by lips 40, this contour also is formed by machining the cured flat plates. The specification does not teach or disclose how the plies are laid up. But the Doyle specification clearly envisions exposed fiber, which



suggests the machining of the base plate 20 from the flat plate (column 6, lines 51-58), which is specifically excluded from claim 1 of Appellants' invention. Livesay et al. adds nothing more in this regard.

MPEP §2145 Subsection D.2 indicates that references cannot be combined where the references teach away from their combination. In this regard, the MPEP states "It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983) (The claimed catalyst which contained both iron and an alkali metal was not suggested by the combination of a reference which taught the interchangeability of antimony and alkali metal with the same beneficial result, combined with a reference expressly excluding antimony from, and adding iron to, a catalyst.)." MPEP §2141.02 further requires that the prior art be considered in its entirety, including disclosures that teach away from the claims. More specifically,

A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. W.L. Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984) (Claims were directed to a process of producing a porous article by expanding shaped, unsintered, highly crystalline poly (tetrafluoroethylene) (PTFE) by stretching said PTFE at a 10% per second rate to more than five times the original length. The prior art teachings with regard to unsintered PTFE indicated the material does not respond to conventional plastics processing, and the material should be stretched slowly. A reference teaching rapid stretching of conventional plastic polypropylene with reduced crystallinity combined with a reference teaching stretching unsintered PTFE would not suggest rapid stretching of highly crystalline PTFE, in light of the disclosures in the art that teach away from the invention, i.e., that the conventional polypropylene should have reduced crystallinity before stretching, and that PTFE should be stretched slowly.).

Here, Wiley and Doyle are not properly combinable for the purpose set forth by the Examiner. Wiley teaches the use of randomly oriented graphite fibers in a compression molded tube clamp. Doyle teaches the use of both randomly oriented fibers and aligned fibers. While the disclosure of Doyle with regard to randomly oriented fibers is properly combinable with Wiley, the teaching of Doyle with regard to the use of aligned fibers, the combination suggested by the Examiner, is directly contrary to the continuous compression molding teaching of Wiley,

and hence the proposed combination is not proper under MPEP §2145 D.2, nor is there anything in either reference to lead one skilled in the art to go in the direction suggested by the Examiner, that is, to select the aligned fiber of Doyle.

Claims 2-10 and 31-35 are dependent on claim 1. To the extent that the combination of Wiley in view of Doyle fails to form a proper combination for the rejection of claim 1 based on Wiley in view of Doyle, Livesay et al. and the admitted prior art, it also fails to form a proper combination for the rejection of the claims dependent on claim 1.

With regard to claims 2-4, the Examiner states:

Regarding claims 2-4, Doyle only discloses the fibers can be aligned. Livesay et al. discloses that aligned fibers can be unidirectional or woven fabric. (Col. 4, ll. 12-17). One in the art would appreciate that the aligned fibers of Doyle in the clamp of Wiley could be either unidirectional or woven fabric since Livesay et al. discloses these types of aligned fibers can be used in molding, and since one skilled in the art could use the generally available types of aligned fiber pre-pregs as shown for example by Livesay. (Col. 4, ll. 12-17).

The combination of Wiley, Doyle and the admitted art has been discussed above as an improper combination. Livesay et al. adds nothing not already disclosed by the prior art. All that has been said with regard to Wiley, Doyle and the admitted prior art is equally applicable to this rejection. Appellants note that Livesay et al. is a vacuum molding process for impregnating and partially curing a first prepreg and may not even be combinable with the compression molding process of Wiley. However, since it discloses forming and partially curing a first prepreg, it adds nothing to the combination of Wiley, Doyle and the admitted prior art. Since the combination of Doyle and Wiley suggested by the Examiner is directly contrary to the continuous compression molding teaching of Wiley and, since Livesay et al. adds nothing to this combination, the proposed combination is not proper under MPEP §2145 D.2 and the rejection of claims 2-4 is not proper.

With respect to claim 4, the Examiner further states: "Regarding claim 4, woven fabrics are considered bi-directional since the warp and weft are oriented in different directions." The combination of Doyle and Wiley suggested by the Examiner is directly contrary to the teaching of Wiley, as discussed above, and, this definition adds nothing to rehabilitate this combination.

The proposed combination remains improper under MPEP §2145 D.2 and the rejection of claim 4 is not proper.

With respect to claim 5, the Examiner further states: "Regarding claim 5, the sheet is formed from graphite fiber with polyimide resin. (Wiley, Col. 3, ll. 49; Alston et al., col. 1, ll.33-36)." Alston is introduced for the first time in this rejection. Appellants assume that the rejection is based on the combination of Wiley in view of Doyle, Livesay et al., and the admitted prior art and further in view of Alston, U.S. Patent No. 6,103,864. Alston discloses the use of graphite reinforced PMR-15 as a high temperature composite resin. Like Wiley, it doesn't disclose a sheet of fiber material. The combination of Doyle and Wiley as applied by the Examiner, is directly contrary to the teaching of Wiley, as discussed above, and, Alston's use of PMR-15 does not rehabilitate this combination. The proposed combination remains improper under MPEP §2145 D.2 and the rejection of claim 5 is not proper.

Claim 6 is specifically rejected. The Examiner states:

Regarding claims 6-8, Wiley discloses clamp with the same thickness throughout. The admitted prior art discloses a clamp with a different thickness in different locations (Figure 1). One in the art would appreciate the method of Wiley, Doyle and Livesay et al. could be used to form other types of clamps such as that of the admitted prior art since they are both clamps used in the airline industry and therefore have the same type of requirements. When forming clamps such as that of the admitted prior art, one in the art would appreciate that a filler would be needed between the top and bottom of the clamp as the clamp is not the same thickness throughout and fiber plies are. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use some type of filler such as fiber plies cut to shape since this would fill in the space between the top and bottom of the clamp known in the admitted prior art while using the same types of materials with the same strengths.

As previously discussed, the present invention solves the problem with abrasion in tube clamps used in applications in which there is inherent movement between the tube and the clamp, particularly abrasion from exposed fibers. Wiley, Doyle, Livesay et al. and the admitted prior art have been discussed above. All that has been said regarding these references is equally applicable to this rejection and will not be repeated for brevity. The combination of Wiley, Doyle and Livesay, et al. is infirm for the reasons stated above. Furthermore, the fact that the admitted prior art may disclose the use of plies does not rehabilitate the infirm combination of

Wiley, Doyle and Livesay, et al. that forms the foundation of this rejection. These dependent claims 6-8 include all of the limitations of independent claim 1, and add additional limitations, claim 1 not being obvious over the cited art as discussed above.

With regard to claims 10 and 11, the Examiner states:

Regarding claims 10 and 11, Wiley discloses the clamp is compression molded. (Col. 3, ll. 50-51) but does not disclose the exact type of apparatus used. Livesay et al. discloses products can be formed by laying up dry fiber mats, impregnating them with resin, and autoclaving them. (Col. 1, ll. 29-39). It would have been obvious to one of skill in the art at the time the invention was made to layer up dry fiber layers, impregnate them with resin, and autoclave them, since Livesay et al. discloses this method forms structures with high strength-to weight ratios (Col. 1, ll. 16-20) as would be required for a clamp.

Claim 10 is dependent on claim 1 and will be discussed separately from independent claim 11. Claim 10 incorporates all of the limitations of claim 1 and adds further limitations. Claim 10 does not discuss the infiltration of dry mat. Appellants submit that there is nothing in this argument that rehabilitates the infirm combination of Wiley in view of Doyle as discussed above, which arguments are applicable to this rejection and are not repeated for the sake of brevity.

The rejection of independent claim 11 is also improper. Wiley teaches the use of randomly oriented fibers, as previously discussed. Doyle is not discussed specifically by the Examiner here, but the rejection of claim 11 initially was based on the combination of Wiley in view of Doyle, Livesay et al. and the admitted prior art. To the extent that Doyle remains part of this rejection, all that was stated above with respect to the rejection of Wiley in view of Doyle is equally applicable to this rejection. With regard to claim 11, claim 11 does not disclose laying up dry fiber mat, as attributable to Livesay et al. by the Examiner, but rather curable material having embedded fibers. Thus to the extent that this rejection does not include the infirm combination of Wiley in view of Doyle, it will be discussed below as not yielding Appellants' invention. To the extent that the rejection does include this infirm combination, it is improper. As discussed above.

Claim 12 is also rejected. The Examiner states:

Regarding claim 12, Wiley discloses the process to make a clamp. One in the art would understand that a clamp would have two halves, both made via the same molding technique.

Independent claim 12 is similar to claim 1, but adds a limitation both halves of the tube clamp be made simultaneously. The rejection of claim 12 initially was based on the combination of Wiley in view of Doyle, Livesay et al. and the admitted prior art. All that has been said above regarding the rejection of claim 1 is equally applicable to claim 12, and will not be repeated here for brevity. The added limitation to manufacture both halves of the tube clamp does not affect the response previously provided, as the clamp, whether unitary or in halves, cannot include exposed fibers as claimed.

Claim 31 is rejected under 35 U.S. C. §103(a) as unpatentable over Wiley in view of Doyle, Livesay et al and the admitted prior art as applied to claim 2 above, and further in view of Yamamoto et al. The Examiner states:

The references cited do not disclose different plies of unidirectionally oriented fibers arranged in directions so the fibers are at an angle to each other. It is well known in general in the fiber prepreg arts to orient different layers of unidirectional fibers in different directions so that the web is not weak in any one direction in particular as shown for example by Yamamoto et al. which discloses layering multiple plies of unidirectional plies so that fibers are oriented in different directions. (Figure 6). It would have been obvious to one of ordinary skill in the art at the time the invention was made to orient different plies of unidirectional fibers in different directions since it is well-known in the general in the fiber prepreg arts to do so as shown for example by Yamamoto et al. (Fig. 6).

Appellants agree with the Examiner's characterization of Yamamoto. Appellants note that this claim is dependent on claim 1, incorporating all the limitations of claim 1 and adding additional limitations. Appellants note that this rejection also relies on the infirm combination of Wiley in view of Doyle. This combination is discussed above, and all that has been said above is equally applicable here and need not be repeated.

**B. Re Wiley In View of Doyle, Livesay et al. and Admitted Prior Art, Even If Properly Combinable, Do Not Yield Appellants' Claimed Invention**

Wiley in view of Doyle, Livesay et al. and the admitted prior art have been discussed in (8.A) above and the summary of these references will not be repeated here.

Assuming *arguendo*, that one of ordinary skill in the art were to go against the teachings of Wiley, which teaches the use of graphite fiber of random orientation, and make the combination with Doyle as suggested by the Examiner, one would still not be inherently led to the disclosed and claimed invention. First, one would have to select between the two disclosed fiber disclosures set forth in Doyle, one which is consistent with Wiley, teaching the use of randomly oriented fibers, and one teaching away from Wiley, using aligned fibers. Even after choosing the aligned fibers in contradiction to the teachings of Wiley, and without any motivation to make this selection, the Examiner's combination still does not provide Appellants invention as all claim limitations must be taught or suggested by the prior art. MPEP §2143.03 states:

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Here, important claim limitations include curing the material to at least near net shape and removing the cured material from the layup tooling without exposing the fibers. These are key claim elements. Providing clamps that are not net shape has typically required machining, which has resulted in exposure of fibers, even when plies are aligned. Fibers are also exposed as a result of random orientation of the fibers. These exposed fibers, a problem with prior art composites, cause abrasion of the tube. These key claim limitations are not taught or suggested by the prior art as required by MPEP §2143.03. That the Wiley disclosure does not teach Appellants' invention is clear in that Wiley utilizes grommets. The grommets are in contact with the fuel tube itself, functioning as the wear sleeve as taught by Appellants at page 2, lines 9-12 of their

specification and prevent fibers in the clamp from causing wear of the tube by preventing contact between the clamp and the tube. Doyle adds nothing in this regard. Doyle also is described by Appellants in their specification at page 1, line 24 - page 2, line 4. Doyle clearly identifies resin and fiber (in the form of powder) from the tube clamp in contact with the tube, but teaches that such contact is beneficial, as the powder resulting from wear of the fiber and resin will act as lubricants. *See Doyle* at column 6, lines 56-58. There is also nothing in Doyle to suggest that either the base plate or the capture plate is molded to near net shape, or that these plates are removed after curing with no exposed fibers. To the contrary, Doyle suggests that the contours of the plates are machined, as previously discussed. *Livesay et al.* adds nothing in this regard. The admitted prior art describes Wiley and Doyle as previously discussed. Since independent claims 1, 11 and 12 include these limitations, which are not taught or suggested by the cited art, the references, even if combined, do not yield Appellants' invention. Thus, there is nothing in either Wiley or Doyle to suggest Appellants' claims, and the cited art does not disclose, teach or otherwise suggest Appellants' invention as claimed.

### **C. Re The Claimed Invention as a Whole Must Be Considered**

Ascertaining the differences between the prior art and the claims at issue requires interpreting the claim language, and considering both the claim language and the prior art references as a whole. This is set out in both MPEP §2141.02, which provides:

Ascertaining the differences between the prior art and the claims at issue requires interpreting the claim language, and considering both the invention and the prior art references as a whole. *See MPEP Section 2111 - Section 2116.01 for case law pertaining to claim interpretation.*

In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *Schenck v. Nortron Corp.*, 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983) (Claims were directed to a vibratory testing machine (a hard-bearing wheel balancer) comprising a holding structure, a base structure, and a supporting means which form "a single integral and gaplessly continuous piece." Nortron argued the invention is just making integral what had been made in four bolted pieces, improperly limiting the focus to a structural difference from the prior art and failing to consider the invention as a whole. The prior art perceived a need

for mechanisms to dampen resonance, whereas the inventor eliminated the need for dampening via the one-piece gapless support structure. "Because that insight was contrary to the understandings and expectations of the art, the structure effectuating it would not have been obvious to those skilled in the art." 713 F.2d at 785, 218 USPQ at 700 (citations omitted).

See also In re Hirao, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) (Claims were directed to a three-step process for preparing sweetened foods and drinks. The first two steps were directed to a process of producing high purity maltose (the sweetener), and the third was directed to adding the maltose to foods and drinks. The parties agreed that the first two steps were unobvious but formed a known product and the third step was obvious. The Solicitor argued the preamble was directed to a process for preparing foods and drinks sweetened mildly and thus the specific method of making the high purity maltose (the first two steps in the claimed process) should not be given weight, analogizing with product-by-process claims. The court held "due to the admitted unobviousness of the first two steps of the claimed combination of steps, the subject matter as a whole would not have been obvious to one of ordinary skill in the art at the time the invention was made." 535 F.2d at 69, 190 USPQ at 17 (emphasis in original). The preamble only recited the purpose of the process and did not limit the body of the claim. Therefore, the claimed process was a three-step process, not the product formed by two steps of the process or the third step of using that product.).

The MPEP further states:

DISCOVERING SOURCE/CAUSE OF A PROBLEM IS PART OF "AS A WHOLE" INQUIRY

"[A] patentable invention may lie in the discovery of the source of a problem even though the remedy may be obvious once the source of the problem is identified. This is part of the subject matter as a whole, which should always be considered in determining the obviousness of an invention under 35 U.S.C. Section 103." In re Spinnoble, 405 F.2d 578, 585, 160 USPQ 237, 243 (CCPA 1969). However, "discovery of the cause of a problem . . . does not always result in a patentable invention. . . . [A] different situation exists where the solution is obvious from prior art which contains the same solution for a similar problem." In re Wiseman, 596 F.2d 1019, 1022, 201 USPQ 658, 661 (CCPA 1979) (emphasis in original).

In In re Spinnoble, the claim was directed to a plural compartment mixing vial wherein a center seal plug was placed between two compartments for temporarily isolating a liquid-containing compartment from a solids-containing compartment. The claim differed from the prior art in the selection of butyl rubber with a silicone coating as the plug material instead of natural rubber. The prior art recognized that leakage from the liquid to the solids compartment was a problem, and considered the problem to be a result of moisture passing around the center plug because of microscopic fissures inherently present in molded or blown glass. The court found the inventor discovered the cause of moisture transmission



was through the center plug, and there was no teaching in the prior art which would suggest the necessity of selecting applicant's plug material which was more impervious to liquids than the natural rubber plug of the prior art.

In In re Wiseman, 596 F.2d at 1022, 201 USPQ at 661, claims directed to grooved carbon disc brakes wherein the grooves were provided to vent steam or vapor during a braking action to minimize fading of the brakes were rejected as obvious over a reference showing carbon disc brakes without grooves in combination with a reference showing grooves in noncarbon disc brakes for the purpose of cooling the faces of the braking members and eliminating dust, thereby reducing fading of the brakes. The court affirmed the rejection, holding that even if applicants discovered the cause of a problem, the solution would have been obvious from the prior art, which contained the same solution (inserting grooves in disc brakes) for a similar problem.

With regard to ascertaining the differences between the prior art and the claims at issue, including interpreting the claim language, and considering both the claim language and the prior art references as a whole, the references and the admitted prior art have been discussed above. Each of independent claims 1, 11 and 12 require, in the process of forming the tube clamp, layering a plurality of sheets along a contour tooling having a predetermined shape, curing the composition to at least near net shape and then removing or separating the cured composite material from the layup tooling without exposing the fibers. Of course, this is the result of layering the sheets of material parallel to the surface of the special contour layup tooling. While the cited references and the admitted prior art discuss tube clamps for gas turbine engines and methods of forming the tool clamps, the cited references and the admitted prior art do not teach or suggest laying up the material for the tube clamp in the specific manner taught and claimed by the appellants. The Wiley reference permits the use of random fiber and in fact places a grommet between the tube clamp and the tube. Doyle specifically permits the use of random fibers, which will result in the exposure of the fiber ends. That both references permit random fibers is to be expected since, clearly, neither Wiley, Doyle, Livesay et al. or the admitted prior art recognize the problems caused by the fiber ends of a tube clamp in contact with a tube. Appellants have discovered that exposed fibers cause wear of the tube in contact with the tube clamp. Since discovery of the source of the problem is part of the "as a whole inquiry," and since the recognition of the problem is clearly absent from the cited art, it is clear that each of the independent claims is patentable over the cited art. The dependent claims, which include further limitations in addition to those set

forth in the independent claims, are also believed to be patentable. Ascertaining the differences between the prior art and the claims at issue requires interpreting the claim language, and considering both the claim language and the prior art references as a whole.

**D. Re Combination of Wiley in view of Doyle, Livesay et al. and the Admitted Prior Art is Based on Hindsight Reasoning by the Examiner.**

Wiley, Doyle, Livesay et al. and the admitted prior art have been discussed in (8.A) above and the summary of these references will not be repeated here.

It is clear that the Examiner has scoured the cited references for each of the elements disclosed in the Appellants' claims without consideration of what the references teach as a whole. The Examiner then attempts to combine the references to achieve the Appellants' claims without any teaching or suggestion in the references to make the combination. The resulting combination, improper though it is, is disjointed and still doesn't arrive at the Appellants' claims. Such combinations, lacking in the necessary motivation and ignoring the teachings of the cited references "as a whole" smacks of impermissible hindsight, as well as "obvious to try" rationale. The Examiner can arrive at this combination only as a result of hindsight reasoning that results only after exposure to Appellants' claims that result after Appellants' have disclosed the problem. However, an unbiased examination requires the references to be viewed without the benefit of hindsight afforded by exposure to the claimed invention. *See Hodosh v. Block Drug Co., Inc.*, 786 F.2d 1136, 1143 at n.5, 229 USPQ 182, 187 at n.5 (Fed. Cir. 1986). It is well established that "obviousness cannot be found by hindsight combination to produce the claimed invention. It is the prior art itself, and not the Appellants' achievement, that must establish the obviousness of the combination." *See In re Dance*, 48 USPQ2d 1635 (Fed. Cir. 1998). Here, none of the cited references teaches the source of the problem discovered by Appellants, nor do they teach or suggest the solution provided by Appellants. It is true that Wiley and Doyle teach the use of materials in a tube clamp identical to those used by Appellants, but none of the references or the admitted prior art teach the arrangement of these materials in the manner suggested by Appellants to eliminate the problem identified by Appellants, that is, wear of tubes caused by contact of exposed fibers from the tube clamps. If the cited art teaches anything, it is

that it does not recognize the problem solved by Appellants' invention. It is clear that the Examiner arrives at the combination of references resulting in the above rejections only after exposure to the ideas and teachings set forth by Appellants. Thus, independent claims 1, 11 and 12 are not rendered obvious by the proposed combination, nor are the claims depending from these independent claims.

### **SUMMARY**

In summary, Appellants claim a process for forming a tube clamp comprising the steps of providing a plurality of sheets of curable material having embedded fibers. The fibers are aligned so as to be parallel to the surface to layup tooling, (i.e. along the contour of the tooling) the layup tooling having a preselected shape to yield the desired contours of the tube clamp. The sheets of laid up curable material is cured to at least near net shape, so that little or no subsequent operations are required to be performed thereon to expose the fibers, and the cured material is removed from the tooling without exposing the fibers. The sheets preferably include unidirectionally oriented fiber, although bidirectionally oriented (woven) fiber may be used, the bidirectional fibers lying substantially in a plane. The sheets may also be laid up so that adjacent sheets have fibers in adjacent, parallel sheets running at an angle to one another. Filler material may be added as cut plies or as random fiber materials to areas away from the surface of the tube clamp so as to add strength to the clamp, but without jeopardizing the integrity of the surface of the clamps.

The claimed invention is unlike the cited prior art. While cited art Wiley and Doyle teach the same materials taught by Appellants in a tube clamp, neither teach the arrangement of the materials as taught by Appellants. Both Wiley and Doyle teach away from Appellants' claimed invention. Doyle teaches away from Appellants' invention by allowing the use of randomly oriented fibers. Although Doyle does teach the use of aligned fiber to make a flat plate, it does not teach the process of aligning the fiber along a contour so that a near net shape is achieved. The aligned fibers of Doyle oriented in any other direction will result in exposed fiber ends. Furthermore, Wiley suggests to one skilled in the art to use the random fiber alternative disclosed in Doyle and not the aligned fiber alternative selected by the Examiner. Doyle also teaches that exposed fiber is beneficial in that it can produce powders that act as lubricant, contrary to


Appellants' teachings. The tube clamp contours disclosed in Doyle appear to be achieved by machining the flat plate, which is disclosed in Appellants' admitted art as unacceptable.

Appellants respectfully submit that the combination of references used by the Examiner to reject Appellants' claims is improper. Appellants further submit that this combination does not yield Appellants' invention as claimed.

When the claims are viewed against the cited references as a whole, Appellants' claims are not obvious. The Examiner arrives at this combination as a result of impermissible hindsight. Even, if proper, the combination does not yield Appellants' invention. Accordingly, favorable consideration of this appeal is respectfully requested.

Respectfully submitted

McNees Wallace & Nurick

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Dated: March 26, 2004

Appendix – Claims 1-12, 31-35.

## APPENDIX 1

A copy of the appealed claims, as presented in the most recent amendment, is provided below. Claims cancelled without prejudice, but not part of this appeal, are not provided.

1. A process for forming a tube clamp comprising the steps of:
  - providing a plurality of sheets of curable material having embedded fibers, each sheet having a length and a width to form a plane, and a thickness, the fibers embedded in the curable material to form a matrix in which the fibers are substantially within the plane of the sheet;
  - layering the plurality of sheets of curable material to a preselected thickness along a contour of layup tooling having a predetermined shape;
  - curing said material to at least near net shape; then
  - removing said cured material from said layup tooling while retaining the shape of said layup tooling without exposing fibers.
2. The process of claim 1 wherein the step of providing the plurality of sheets and layering of the plurality of sheets further includes layering sheets of unidirectionally oriented fibers in a polymer resin matrix, and wherein the step of removing said cured material further includes removing said cured material while maintaining the fibers along the contour of the layup tooling as continuous.
3. The process of claim 1 wherein the step of providing a plurality of sheets and layering of sheets further includes providing and layering sheets of woven fibers in a polymer resin matrix, and the step of removing said cured material further includes removing said cured material while maintaining the fibers along the contour of the layup tooling as continuous.
4. The process of claim 1 wherein the step of layering of sheets further includes layering sheets of fibers bi-directionally oriented fibers in a polymer resin matrix, the bi-directionally oriented fibers lying within the plane of the plurality of sheets.
5. The process of claim 1 wherein the curable matrix is a polyimide resin matrix and the fibers are carbon fibers.
6. The process of claim 1 wherein the step of layering a plurality of sheets includes layering a first plurality of sheets to a predetermined thickness to form a bottom ply layer, layering a

second plurality of sheets to a predetermined thickness to form a top ply layer, and further includes sandwiching filler material between the top ply layer and the bottom ply layer.

7. The process of claim 6 wherein the filler material includes a plurality of plies cut to a predetermined shape to fill a region between the bottom ply layer and the top ply layer.
8. The process of claim 7 wherein the step of sandwiching filler material between the top ply layer and the bottom ply layer includes layering sheets of random fiber mat comprising chopped fiber in polymer resin, between ply layers comprising sheets having fibers embedded in the curable material to form a matrix in which the fibers are substantially within the plane of each sheet so that the tube clamp adjacent to a tube includes no exposed fiber.
9. The process of claim 1 wherein the step of curing includes autoclaving said material at a predetermined temperature and pressure.
10. The process of claim 1 wherein the step of curing includes processing in a match metal press having a movable upper platen at a predetermined temperature and pressure.

11. A process for forming a tube claim comprising the steps of:

providing a plurality of sheets of curable material having embedded fibers, each sheet having a length and a width to form a plane, and a thickness, the fibers embedded in the curable material to form a matrix in which the fibers are substantially within the plane of the sheet;

layering the plurality of sheets of fiber to form a fiber bundle of a preselected thickness along a contour of layup tooling having a predetermined shape;

injecting polymer into the tooling to the impregnated fiber bundle;

curing the impregnated fiber bundle to at least near net shape;

then removing said cured material from said layup tooling while retaining the shape of said layup tooling without exposing fibers.

12. A process for forming a tube clamp comprising the steps of:

providing a plurality of sheets of curable material having embedded fibers, each sheet having a length and a width to form a plane, and a thickness, the fibers embedded in the curable material to form a matrix in which the fibers are substantially within the plane of the sheet;

layering a first plurality of sheets of the curable material to a preselected thickness along a contour of a first layup tooling having a first predetermined shape;

layering a second plurality of sheets of curable material having fibers embedded in a curable matrix to a second preselected thickness along a contour of second layup tooling having a second predetermined shape, the first predetermined shape and second predetermined shape having mating interfaces;

curing said first plurality of sheets of curable material and second plurality of sheets of curable material to net shape;

removing the cured material from said first and second layup tooling while retaining the contour of said toolings having predetermined shapes without exposing fibers; and

mating said cured material from said first and second layup tooling along the mating interfaces.

13. – 30. Cancelled without prejudice.

31. The process of claim 2 wherein the layering the sheets of the unidirectionally oriented fibers further includes layering adjacent sheets so that the fibers in the adjacent sheets are angled at predetermined angular orientations.

32. The process of claim 6 wherein layering a first plurality of sheets to a predetermined thickness to form a bottom layer includes layering sheets of unidirectional fiber.

33. The process of claim 6 wherein layering a first plurality of sheets to a predetermined thickness to form a bottom layer includes layering sheets of woven fiber.

34. The process of claim 6 wherein layering a second plurality of sheets to a predetermined thickness to form a top layer includes layering sheets of unidirectional fiber.

35. The process of claim 6 wherein layering a second plurality of sheets to a predetermined thickness to form a top layer includes layering sheets of woven fiber.

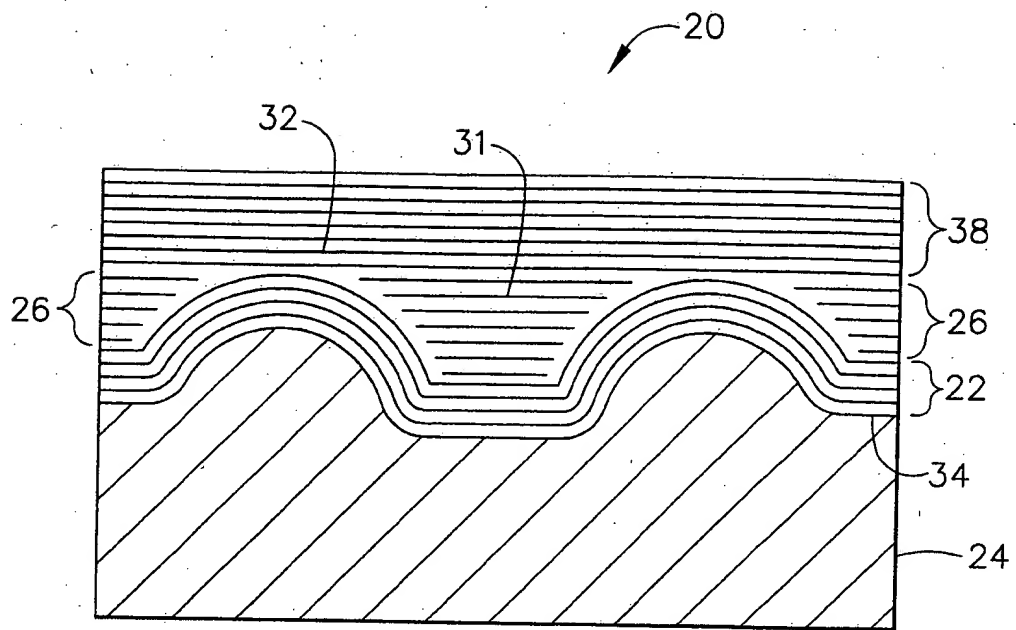


FIG. 2



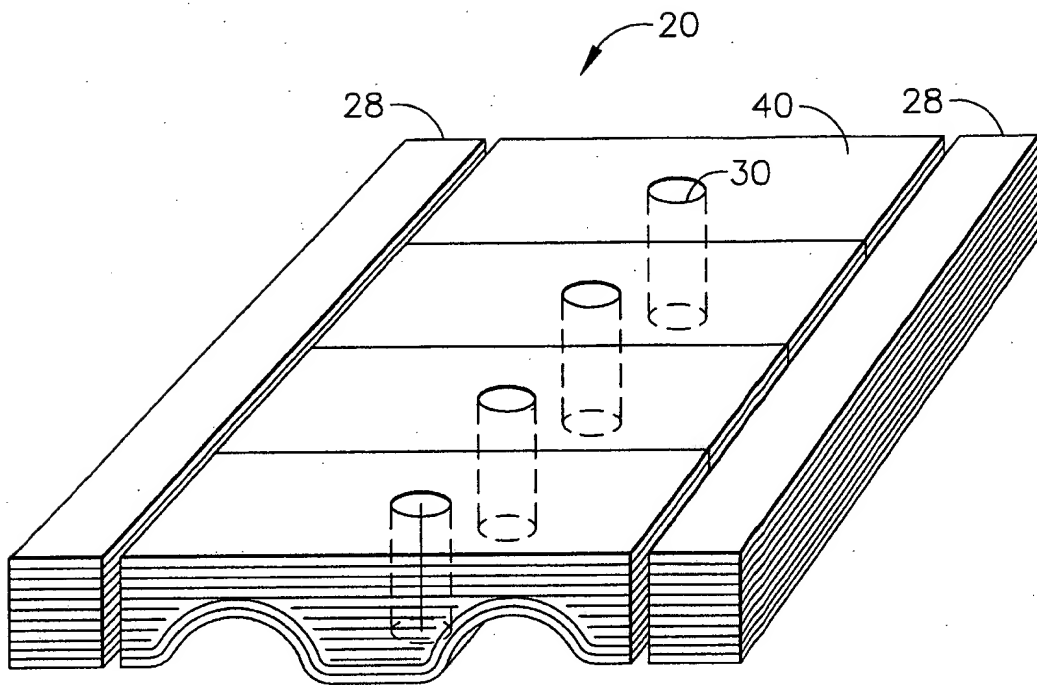


FIG. 3

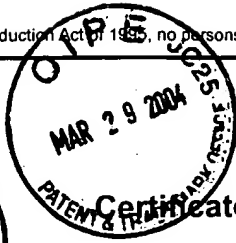
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# FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$) 330

## Complete if Known

Application Number 09/613,162  
Filing Date 07/10/2000  
First Named Inventor MESING et al.  
Examiner Name Barbara J. Musser  
Art Unit 1733  
Attorney Docket No. 13DV-12817 (07783-0046)

## METHOD OF PAYMENT (check all that apply)

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Deposit Account Number

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The Director is authorized to: (check all that apply)

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## FEE CALCULATION

### 1. BASIC FILING FEE

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee (\$)	Fee Code	Fee (\$)		
1001	770	2001	385	Utility filing fee	
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1)

(\$ 0)

### 2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

	Total Claims	Extra Claims	Fee from below	Fee Paid
Total Claims	-20 **	0	X	0
Independent Claims	-3 **	0	X	0
Multiple Dependent			X	0

Large Entity		Small Entity		Fee Description
Fee Code	Fee (\$)	Fee Code	Fee (\$)	
1202	18	2202	9	Claims in excess of 20
1201	86	2201	43	Independent claims in excess of 3
1203	290	2203	145	Multiple dependent claim, if not paid
1204	86	2204	43	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2)

(\$ 0)

\*\*or number previously paid, if greater; For Reissues, see above

## FEE CALCULATION (continued)

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1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1401	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	330
1403	290	2403	145	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,330	2453	665	Petition to revive - unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17 (q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	770	2809	385	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	770	2801	385	Request for Continued Examination (RCE)	
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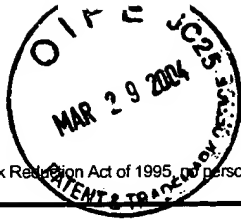
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	First Named Inventor	MESING et al.	
	Art Unit	1733	
	Examiner Name	Barbara J. Musser	
Total Number of Pages in This Submission	78	Attorney Docket Number	13DV-12817 (07783-0046)

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SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT	
Firm or Individual name	McNees Wallace & Nurick LLC Carmen Santa Maria
Signature	<i>Carmen Santa Maria</i>
Date	March 26, 2004

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